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Appl. No. 09/600,607
Brief
Brief following Appeal of 5 May 2003

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Appl. No.	: 09/600,607
Appellant(s)	: KUIJPER, Maarten
Filed	: 19 July, 2000
Title	: IMAGE PROJECTION SYSTEM WITH IMPROVED CONTRAST
TC/A.U.	: 2871
Examiner	: SCHECHTER, Andrew M.
Atty. Docket	: PHN 16,643

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On: July 3, 2003

By: John C Fox

APPELLANT'S APPEAL BRIEF

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Sir:

BRIEF OF APPELLANT

This Brief of Appellant follows a Notice of Appeal, dated 5 May, 2003, appealing the final rejection of claims 1-5, 7 and 8 of the application, the final rejection dated 6 February, 2003. All requisite fees set forth in 37 CFR 1.17(c) for this Brief are hereby authorized to be charged to Deposit Account No. 501850.

REAL PARTY IN INTEREST

The real party in interest in this appeal is the assignee of all rights in and to the subject application, Koninklijke Philips Electronics, N.V. of The Netherlands.

RELATED APPEALS AND INTERFERENCES

To the best of the knowledge of the undersigned, no other appeals or interferences are known to Appellants, Appellants' legal representatives, or assignee which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

STATUS OF CLAIMS

Of the original claims 1-8, claims 1 and 3-8 were amended and claim 6 was cancelled. Claims 1-5, 7 and 8 stand finally rejected as set forth in the final Office Action dated 6 February, 2003, and are the subject of this appeal.

STATUS OF AMENDMENTS

No amendment to the specification and/or claims was offered subsequent to the final Office action. All amendments have been entered.

SUMMARY OF THE INVENTION

The invention relates to an image projection system (1) comprising an illumination system (3) for supplying an illumination beam, a modulation system (11) for modulating said illumination beam in conformity with image information to be projected, and an optical system (15) for projecting an image, the modulation system (11) comprising at least one liquid crystalline image display panel having a first (12) and a second (14) polarizer between which a layer of TN (twisted nematic) liquid crystalline material (13) is enclosed. Page 1, lines 1-6.

An increasingly higher image quality is aimed at in image projection systems with liquid crystalline image display panels. The image contrast on the projection screen is *inter alia* determined by the absorption which can be realized in the dark state of the panels. Pixels of a TN-LCD (twisted nematic liquid crystal display) across which no voltage is applied are maximally transparent. In an image, these pixels are in a bright state. Pixels across which a voltage is applied absorb light and are thus in a dark state. However, the absorption is limited and is not the same for all directions of incidence of the light beam. Consequently, the dark state may still be relatively bright, notably for directions of incidence of the light for which the absorption is worse. This gives rise to a relatively poor image contrast. Moreover, a poor contrast of the image display panel has detrimental effects on the color reproduction. Page 1, lines 9-19.

The image contrast is determined, *inter alia*, by the transmission characteristic of the image display panel. Such transmission characteristics vary with the direction of the

incident light beams. Consequently, the transmission characteristics are determined by the illumination profile which is incident on the image display panel. Moreover, only the light which is incident on the projection lens within a given angle will be passed. This is referred to as the acceptance angle. A maximal display panel contrast is aimed at within this acceptance angle. Page 1, lines 20-25.

The viewing angle dependence of the image contrast as a consequence of the dependence of the image display panel on the direction of the illumination beam results from the residual retardation of the liquid crystalline material. Light which propagates in directions which are not parallel to the director of the liquid crystalline material will undergo a small birefringence. In European patent application EP 0 390 511, this problem is solved by providing at least one additional optically transparent element of a positive birefringent material at the liquid crystalline layer, with optical properties which compensate for said residual retardation in a single viewing direction. Page 1, line 26 through page 2, line 5.

This solution has the drawback that the contrast is only optimized within a very narrow cone of viewing directions, with the result that the high contrast area is only shifted in position. Moreover, the parameters of the compensation elements have a very small tolerance. Page 2, lines 6-9.

According to the invention, an image projection system is provided in which the image display panel comprises a single birefringence-compensating element between the layer and one of the two polarizers, which element has a tilted optical director profile whose projection in the plane of the polarizers encloses an angle ϕ different from 0 with the active

rubbing direction of the layer. Page 2, lines 14-18.

The active rubbing direction is understood to mean the rubbing direction which determines the contrast in the viewing directions perpendicular thereto, in which directions the contrast is to be improved. The contrast in a given viewing direction is determined by the part of the liquid crystalline layer whose rubbing direction is substantially perpendicular to this viewing direction. Page 2, lines 19-23.

The present invention is based on the recognition that the fact that a relatively small viewing angle with respect to the illumination system is sufficient for a liquid crystalline image display panel in an image projection system can be used to great advantage. The high contrast area is to be widened and shifted towards the directions from which the main illumination beams illuminating the image display panel originate. The viewing angle within which the contrast is to be improved is determined by the angular spread of the illumination beams and by the acceptance angle of the projection lens. Page 2, lines 24-30.

Since, for projection, a high contrast area is sufficient which extends in the direction of the main illumination beams of the illumination system, which is in contrast to direct-vision systems in which the high contrast area is to extend both in the horizontal and the vertical direction, it is sufficient to use a single birefringence-compensating element. Moreover, the element is rotated so that the optical axis of the element encloses an angle ϕ different from 0 with the active rubbing direction of the liquid crystalline material. The drastic change of the symmetry of the contrast curves thus does not have any detrimental effects for projection applications. Since ϕ is different from 0, an

improved contrast is now also possible upon perpendicular incidence. Page 2, line 31 through page 3, line 5.

Since use is made of a single element, the material costs are reduced and less absorption will occur in the bright state. Moreover, the tolerances are less strict than in the known systems. Page 3, lines 6-8.

ISSUES

1. Are Claims 1, 3, 4, 7 and 8 unpatentable under 35 USC 103(a) over Xu, US patent no. 6,057,901 (herein 'Xu') in view of Abileah et al. US patent no. 5,737,048 (herein 'Abileah')?

2. Are Claims 1-5, 7 and 8 unpatentable under 35 USC 103(a) over Kawata et al. in view of Abileah et al.?

GROUPING OF CLAIMS

Claims 1-5, 7 and 8 stand or fall together.

ARGUMENT

1. Are Claims 1, 3, 4, 7 and 8 unpatentable under 35 USC 103(a) over Xu in view of Abileah?

Claims 1, 3, 4, 7 and 8 are rejected under 35 USC 103(a) as being unpatentable over Xu in view of Abileah.

Xu teaches a liquid crystal display with two tilted compensation elements (retarders) and two normal (untilted)

retarders. See, for example, col. 5, lines 22-27, and claim 1.

Xu also discloses an embodiment in which only one compensation element (retarder) is employed, i.e., Fig. 14. However, Xu defines the angle of his retarder (31) in terms of the angle θ, which is between 5 and 15 degrees.

The angle θ is defined by Xu in the conventional manner (which is also the manner in which it is defined by Appellant). Thus, the angle θ is defined by Xu as the tilt angle of the optical axis of the retarder with the normal (z axis). See col. 6, lines 60-66, and figs. 14 and 16. Compare figure 2(a) of Appellant, where the angle θ is defined by the direction of the director 37 and the normal 39 (z axis).

The angle ϕ is defined by Xu as the angle between the projection of the viewing angle in the x-y plane and the x axis (see Fig. 16), while Appellant defines the angle ϕ as the angle between the projection of the director in the x-y plane and the x axis which corresponds to the active rubbing direction (see Fig. 2(b).

In teaching a tilt angle θ instead of ϕ, Xu provides no guidance to the skilled artisan which would enable the realization of, and actually teaches away from, an image projection system as claimed by Appellant.

The Examiner has acknowledged that Xu does not teach a tilt angle ϕ, but states that since the active rubbing direction could be either of two rubbing directions at 90° to each other, the angle ϕ must inherently be different from 0 with respect to one of them, so the limitation is met.

However, there is no inherent reason why there should be any angle between the active rubbing direction and the

projection of the director in the x-y plane. It is only with the hindsight gained from Appellant's own teachings that there should be an angle between the active rubbing direction and projection of the director in the x-y plane, and such hindsight is not permitted in judging obviousness under Section 103.

Abileah teaches a liquid crystal display with a single retardation element (13). The optical axis of element 13 is represented by double arrow R, which lies in the x-y plane (col. 9, line 33) and can be rotated in this plane with respect to a direction Ro. This is different from Appellant's invention because in Appellant's invention the optical axis (as represented, for example, by arrow 37 in fig. 2(a)) is tilted and thus does not lie in the x-y plane. In Appellant's invention, what lies in the x-y plane is only a projection of the tilted optical axis (represented by 41 in fig. 2(b)).

The Examiner has urged that Abileah teaches rotating the optical axis by an angle θ, most preferably by an angle of about 6-10°, citing col. 9, line 39 through col. 10, line 4. However, such a rotation of the optical axis would occur in the x-y plane (col. 9, line 33)) with respect to a direction Ro. As already pointed out, this is different from Appellant's invention wherein the optical axis (as represented, e.g., by arrow 37 in fig. 2(a)) is tilted and thus does **not** lie in the x-y plane. In Appellant's invention, what lies in the x-y plane is only a **projection** of the tilted optical axis (represented by 41 in fig. 2(b)).

Thus, Abileah neither teaches nor suggests Appellant's invention. Furthermore, in teaching that angle θ is a rotation angle lying in the x-y plane, rather than a tilt angle with respect to the normal (z axis), as taught by Xu, the teachings

of the references are in conflict, and therefor would not be combined by the skilled artisan in the manner urged by the Examiner. Even if sucha a combination were made, it would not teach or suggest Appellant's claimed invention.

Accordingly, it is urged that the rejection is in error and should be reversed.

2. <u>Are Claims 1-5, 7 and 8 unpatentable under 35 USC 103(a) over Kawata et al. in view of Abileah</u>?

Claims 1-5, 7 and 8 are rejected under 35 USC 103(a) as being unpatentable over Kawata et al. in view of Abileah.

Kawata discloses an LCD including a TNC layer, two optical compensation sheets RF1 and RF2, two polarizing layers PA and PB and a backlight layer BL. The optical compensation sheets are positioned between the TNC layer and polarizing layers PA and PB (fig. 4).

Kawata also discloses an embodiment including a single optical compensation sheet RF1. However, Kawata defines the tilt angle in the same manner as does Xu, i.e., the angle between the optical axis and the normal (see col. 17, lines 24, 25), not the angle between a **projection** of the tilted optical axis in the x-y plane and the active rubbing direction.

Thus, Kawata fails to teach or suggest Appellant's claimed invention. Furthermore, in teaching that angle θ is a tilt angle with respect to the normal (z axis) rather than a rotation angle lying in the x-y plane, as taught by Abileah, the teachings of the references are in conflict, and therefor would not be combined by the skilled artisan in the manner urged by the Examiner. Even if sucha a combination were made, it would not teach or suggest Appellant's claimed invention.

Accordingly, it is urged that the rejection is in error and should be reversed.

CONCLUSION

It has been shown that the claimed invention distinguishes patentably over the teachings of the prior art reference applied, whether taken singly or in combination. Accordingly, Appellant respectfully requests that the Board reverse the Examiner's final rejections and direct that the Application proceed to Issue.

Respectfully submitted,

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APPENDIX A
CLAIMS ON APPEAL

1. (previously amended) An image projection system comprising an illumination system for supplying an illumination beam, a modulation system for modulating said illumination beam in conformity with image information to be projected, and an optical system for projecting an image, said modulation system comprising at least one liquid crystalline image display panel having a first and a second polarizer between which a layer of TN (twisted nematic) liquid crystalline material is enclosed, characterized in that a single birefringence-compensating element is located between the layer of TN (twisted nematic) liquid crystalline material and one of the two polarizers, which element has a tilted optical director profile whose projection in the plane of the polarizers encloses an angle ϕ different from 0 with the active rubbing direction of the layer.

2. (original) An image projection system as claimed in claim 1, characterized in that the birefringence-compensating element is an element having a negative birefringence.

3. (previously amended) An image projection system as claimed in claim 1, characterized in that $0° < \phi \leq 15°$.

4. (previously amended) An image projection system as claimed in claim 1, characterized in that the element is present on that side of the liquid crystalline material where said material has its active rubbing direction.

5. (previously amended) An image projection system as claimed in claim 1, characterized in that the element comprises a negative birefringent foil having a tilted optical director profile.

6. (cancelled)

7. (previously amended) A head-mounted display comprising a liquid crystalline image display panel, an optical system for imaging an image in an observer's eye, and head-supporting means, characterized in that the liquid crystalline display panel is implemented as the image display panel in the image projection system as claimed in claim 1.

8. (previously amended) A liquid crystalline image display panel for use in an image projection system, comprising a layer of TN (twisted nematic) liquid crystalline material which is enclosed between a first and a second polarizer, characterized in that the liquid crystalline image display panel is implemented as claimed in claim 1.